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PATENT APPLICATION FOR A COMPUTER MOTIONAL COMMAND  
INTERFACE

Be it known that, Thomas G. Cehelnik, a citizen of the United States having residence address at 35 Harbor Village, Middletown, RI 02842, has invented a new and useful method and apparatus, A COMPUTER MOTIONAL COMMAND INTERFACE, for which the following is a specification.

CROSS REFERENCE TO RELATED APPLICATIONS

This application is to receive benefit of 60/445,548 filed 2003 Feb 6, and 60/515844 filed 2003 Oct 30.

STATEMENT OF FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

REFERENCE SEQUENCE LISTING OR COMPUTER PROGRAM

Sequence listing is not applicable. A computer program using MATLAB language is provided to demonstrate a motional command recognition algorithm.

BACKGROUND OF THE INVENTION—FIELD OF INVENTION

This invention relates to fields of computer peripherals and motion recognition for the control of electronic apparatus, specifically to aid in the input of commands to computerized devices, and to add artificial intelligence features to a user interface. It is related to proximity and motion sensing of a person and objects.

## 48 BACKGROUND OF THE INVENTION

49

50

51 The ability to communicate with a computer through  
52 peripherals has been developing for years from the punch  
53 card, CRT, DOS keyboard line commands, windows type  
54 programs using the mouse, light pens and stylists, to  
55 speech recognition. All but speech recognition systems  
56 require touch control. A speech recognition interface on  
57 the other hand is not very useful in a public setting.

58

59 It has been determined by some researchers of human  
60 communication that body language comprises as much as 80%  
61 of the message communicated between people in a  
62 conversation. Thus to improve communication between  
63 computers by making the quality of human-computer interface  
64 more humanly realistic and personal, a body language  
65 interfaces is needed.

66

67 Thus human interaction with a computer is void of personal  
68 realism for at least two reasons. One, the users does not  
69 interact with the computer like they do a human being by  
70 using body language and motional commands. Second, because  
71 the computer fails to recognize and respond according to  
72 the state of mind of the user normally indicated through  
73 body language or motional commands. Thus to improve the  
74 personal realism in communicating with a computer, a  
75 motional command interface is needed with a sensing system  
76 to recognize motional commands and body language.

77

78 Virtual reality systems detect and decipher motion by using  
79 gloves with sensors or similar approaches with sensors on  
80 the body for detecting motion. The drawback with these  
81 methods is they require a physical connection to the user  
82 making it awkward for many to use and to switch users.

83

84 Today wireless communication technology and GPS may offer  
85 possibilities but they only track the location of the  
86 device. Thus to recognize body language such as folding  
87 arms, receivers and or transmitters need to be placed over  
88 the user's body. Again such a system is complex connection  
89 of transmitter and receivers located on the user's body.  
90 Another drawback to these technologies is the method  
91 requires the process of active radio transmission that at  
92 times can interfere with communication in aircraft, medical  
93 equipment. Active transmissions uses power and reduce  
94 battery life on portable units. Active transmission is

95 also undesirable when trying to conceal the sensor system  
96 from detection. There are at times when the RF exposure  
97 may cause health risk or concerns to individuals. Also the  
98 active transmission of RF is of concern to the regulating  
99 authorities such as the FCC to avoid excessive electrical  
100 noise. Hence, what is needed is a non-contact motional  
101 command sensing system with option to operate passively.

102  
103 Other motion sensing schemes include real time video image  
104 analysis, sonar, radar, laser or infrared. Video analysis  
105 tends to lack depth perception, and only senses in two-D  
106 unless a variable focal length lens is used. The others  
107 sensing methods becomes impractical to implement a motional  
108 command language interface due to hardware cost, complexity  
109 of hookup, and required processing power. Although the  
110 later may provide 3-D imaging, the main difficulty with  
111 these technologies is beam forming is required. Hence what  
112 is needed is a simplified method of implementing a motional  
113 command interface on personal computing and electronic  
114 devices.

115  
116 At times the motion sensor may require concealment by  
117 embedding it in a material while still maintaining passive  
118 features. It is true that the video analysis is a passive  
119 process, and infrared may be; but neither of said can  
120 covered by common materials such as construction material  
121 and still sense the motional command.

122  
123 Computers widely used today mostly issue a command or  
124 response in the form of keyboard strokes, mouse movements  
125 and clicks, with the exception of speech recognition.  
126 Computer access speed is compromised for simple and  
127 intuitive tasks when using a mouse, keyboard or stylist to  
128 click and point. Examples are in reviewing video or  
129 information on forms and screens, one my need to push the  
130 stop, forward, or okay button with a mouse.

131  
132 Additionally, repetitive movements of using mechanical  
133 peripherals often cause injury, such as running of a scroll  
134 button, or clicking to close a window. These motions all  
135 rely on some mechanical movement of a peripheral device or  
136 involve a pointing process with a pen or finger on a touch  
137 sensitive screen. Lets referrer to this method as the  
138 screen method.

139  
140 In the screen method the interaction zone between the user  
141 and computers is the two-dimensional plane of the screen.

142 This method of interfacing human commands to the computers  
143 is tedious and particularly so on small video screens as on  
144 palm-sized devices. Hence, the human interface with the  
145 computer is slow and tedious. What is needed is a faster  
146 touchless method of controlling the computer through  
147 motional command language where the commands are detected  
148 in a volume of three-dimensional space called the  
149 interaction zone as opposed to mouse movements mapped to a  
150 physical two-dimensional flat space on a computer screen.

151  
152 Systems using mechanical peripheral pointing devices and  
153 the screen method also require visual interaction to  
154 operate. This is at time tedious for even simple tasks.  
155 Also this method is inconvenient for use with mobile  
156 computing device or while being mobile such as when driving  
157 a car. They are also inconvenient when the user is too  
158 distance a from the computer unit to see a mouse cursor.  
159 They are also not applicable when the user is walking into  
160 a room and wishes to use hand signals to issue a commands  
161 to turn on and adjust the lighting. Another example is  
162 when the user is lounging in a chair in front of the TV and  
163 the remote control is elsewhere. In this case if a motional  
164 command systems were installed to have the interaction zone  
165 at the location of the person in the chair, the user could  
166 issue a motion of the hand to change the TV channel or fast  
167 rewind a DVD. Thus what is needed is a motional command  
168 language system self-contained in a computer video display  
169 unit, and with options to have a remote-sensing units  
170 distributed throughout the home or convenient locations.

171  
172 In summary our sensing system requirements are, to make  
173 computer-human more natural, peripheral control devices  
174 need to be self-contained or embedded into the computer or  
175 in objects where the computer is to be controlled from, be  
176 touchless, non-contact, offers passive wireless technology  
177 capability, operate in a three dimensional interactive  
178 zone, remove tedium of visual screen inspection, and senses  
179 and respond to motional commands of the user, and  
180 ultimately body language.

181  
182 No known prior art addresses all the above sensing system  
183 requirements for a motional command system.

184  
185 In this invention uses sensors to detect electric fields by  
186 measuring the electrical potential in space. An electric  
187 potential measurement is done with a high input impedance  
188 electrode so the circuit attached to it does not alter the

189 potential under measurement. The frequency is so low the  
190 fields are almost static or quasistatic, and therefore obey  
191 the principles of electrostatics. These type of fields are  
192 called E-fields.

193  
194 The prior art by Neil Gershenfeld and Joshua R. Smith in  
195 U.S. Patent 6,051,981 uses electric field sources created  
196 by a transmitter with a different sensing method. They also  
197 disclosed a gesture wall, and a Phish as a mouse  
198 controller. Their sensing method measures currents from a  
199 transmitter and into receiving sensors. Their sensors  
200 electrodes are effectively at earth ground electric  
201 potential. This fact causes the receive sensors to distort  
202 the electric potential distribution in space simply by  
203 their presence. Plus there is not a passive option,  
204 since the currents need measured from the transmitter.  
205 Other prior art referenced in their patent seem to not to  
206 have the capability or recognize value of operating  
207 passively.

208  
209 Beaty discloses in on the Internet in 2000, a discrete FET  
210 circuit and an operational amplifier circuit to detect  
211 electric fields signals from static electric charge. The  
212 amplifier produces a signal with strength indicative of  
213 proximity to static charge only. The disclosed is directed  
214 toward detecting static charged objects. No motional  
215 command system is mentioned. Also nothing is said about  
216 detecting uncharged objects.

217  
218 Other capacitive type proximity sensors using AC frequency  
219 shift due to changes in oscillator capacitance have been  
220 recognizes around the time of the advent of radio circuits.  
221 These methods suffer from low input impedance, and  
222 consequently lack range, and alter the background field by  
223 the antenna. This occurs because a resonant tank circuit is  
224 used. They also require an oscillator attached to an  
225 antenna, so it is really an active method.

226  
227  
228  
229 The inventor is not aware of prior art found passively  
230 using the AC 50 Hz-60 Hz part of the electromagnetic  
231 spectrum with a high input impedance device. In fact, most  
232 low frequency electronic devices designers struggle to  
233 filter out the energy in this frequency band.

236 BACKGROUND OF INVENTION-OBJECTS AND ADVANTAGES  
237  
238

239 The lower the frequency of the electric fields, the more a  
240 quasistatic the electric fields become such that:

- 241
- 242 a) objects except conductors appear as high impedance
  - 243 electrical loads thus do not distort the electric
  - 244 field much, i.e., are essential transparent;
  - 245
  - 246 b) even slightly conductive objects having contact with
  - 247 earth ground have a substantially lower impedance
  - 248 than nonconductors in contact with ground;
  - 249
  - 250 c) electrostatic principles apply;
  - 251
  - 252 d) the electric fields penetrate deeply through objects.
  - 253
  - 254

255 Gershenfeld et. al. disclosures state 100 kHz as an  
256 operating frequency. Also demonstrated devices, as  
257 recalled, operated at frequencies of around 0.5 MHz. At  
258 these frequencies, the objects in vicinity of the body  
259 being detected are more so conductive than at frequencies  
260 below 1 kHz. Thus distortion may occur and contribute to  
261 nonlinearities.

262

263 Gershenfeld does state his method requires the solution of  
264 nonlinear equations. Also the solutions are degenerate,  
265 i.e., not unique defined. Also, his method of using  
266 electrodes at ground potential also requires measurement of  
267 current from a transmitter. Their measurement of current  
268 from the transmitter is to determine the total amount of  
269 current that could be detected in the sensors. If objects  
270 of low electrical potential are near, they will distort the  
271 potential field and affect the measurement accuracy by  
272 reducing current arriving at the receive electrodes.

273

274 The present invention uses receivers with high input  
275 impedance so as not to draw currents or distort the field.  
276 Also, in the passive mode, the frequencies of operation are  
277 that of or near the electrical power line frequency and are  
278 surely quasistatic. These frequencies are extremely low,  
279 and substantially reduce the conductivity of objects near  
280 to the sensor. Thus preventing field distortions.

281

282 With further amplification circuitry not show, we found in  
283 the passive case, the sensitivity of the 60 Hz A.C.  
284 amplitude was found to depend linearly after taking the  
285 logarithm of the response. The sensitivity was detected to  
286 a range of about 40 inches. This range is sufficient to  
287 have good motional command zone defined in front of a  
288 computer monitor, or other device and appliances.

289

290 It is one aspect of this invention to make computers and  
291 robots more human-like by increasing the personal realism  
292 of interacting with these devices through a motional  
293 command system (MCS) that offers a friendly and efficient  
294 means of interfacing the user's motional commands and body  
295 language with the computer.

296

297 It is another aspect of the invention to provide a personal  
298 computer interface that responds more efficiently with less  
299 tedium than using pointing device peripherals.

300

301 It is another aspect of the invention to allow the user of  
302 the MCS to interact more naturally, and be more mobile and  
303 active will interacting with a computer.

304

305 It is another aspect of this invention to make a touchless  
306 motional command system (MCS).

307

308 It is another aspect of the invention to provide a method  
309 for processing MCS data so the computer can recognize and  
310 respond to motional commands and body language of the user  
311 with or without additional modalities.

312

313 Another aspect of the invention is to make as sensing  
314 system for the said MCS.

315

316 It is another aspect of this invention to provide the  
317 computer with visual display or other device having a video  
318 display unit have a self-contained motional command system  
319 (MCS) that includes sensor system, electronic hardware, and  
320 software.

321

322 It is another aspect of the invention to provide a MCS with  
323 remotely locatable sensing system as a peripheral for  
324 receiving motional commands.

325

326 It is another aspect of the invention to provide a method  
327 for defining commands for recognition, and dispatching of  
328 computer responses as a result of the recognition, so the

329 computer is trained to recognizes and responds to the  
330 motional commands of the user.

331

332 Another aspect of the invention is to provide a passive  
333 method to detect motional commands issued to the computer.

334

335 Another aspect of the invention is to provide a passive  
336 method to detect a body's presence and motion.

337

338 Yet another aspect of the invention is provide a method for  
339 processing MCS body language commands whereby the computer  
340 can recognize moods and emotions or matters of urgency of  
341 the user and thus responds with helpful processes and gives  
342 a personality to a computer.

343

344

345

346

## 346 BRIEF DESCRIPTION OF DRAWINGS

347

348 The invention will be better understood upon reading the  
349 following Detailed Description while referencing the  
350 provided drawings.

351

352 FIG1 shows a schematic for the Motional Command Sensor  
353 amplifier.

354

355 FIG2 shows the Thevenin equivalent circuit for the antenna  
356 with effect of adding capacitance  $C_{opt}$  that occurs when the  
357 user's motional-command surface is near antenna. This  
358 model shows the source voltage into the amplifier is  
359 reduced as the motional command surface approaches the  
360 antenna, hence the sensitivity of the amplifier is  
361 decreased. Model predicts from observed measurements that  
362  $C_{opt} = 1/9 C_{ant}$ . The high input impedance of the TL082 makes  
363 the voltage input sensitive to changes in source impedance.  
364 This amounts to sensitivity to small changes in capacitance  
365 at low frequencies such as the A.C. line frequency of 60  
366 Hz.

367

368 FIG3- Shows preferred embodiment of Motion Command System  
369 on a video monitor. Six MCS sensors either are used in  
370 single ended mode relative combined in a differential  
371 amplifier to measure difference with respect to reference  
372 sensor 7. Alternatively, sensors 1 through 6 have a  
373 reference electrode along with the main antenna, so that  
374 two buffer stages like those in FIG1 are combined with a  
375 differential amplifier, and then driven with the filter and  
376 amplifier.

## 377 DETAILED DESCRIPTION- PREFERRED EMBODIMENT

378

379

380 To those skilled in of electronics will recognize the  
381 variation of the technology.

382

383 The local background noise characteristic of the A.C. line  
384 and computer signals are detected and modulated by the  
385 presence of the user's command surface in the vicinity of  
386 the motional command system (MCS) sensors. Here the  
387 command surface is referred to as the hand or body part  
388 issuing the motional command.

389

390 FIG1 describes the sensor as consisting of a small 4 in.  
391 long antenna with an amplifier assembled on a solderless  
392 breadboard. The input stage is a buffer amplifier with  
393 high input impedance, followed by a low pass filter and  
394 then an amplification stage.

395

396 At the low frequency of 50-60 Hz of the A.C. line, the  
397 antenna acts as an equivalent electric source in series  
398 with a capacitor represented in FIG1 as  $C_{ant}$ . To understand  
399 this model, we recall that the conductor is an  
400 equipotential surface maintained at a potential determined  
401 from the background electric fields. Now consider the case  
402 when the user's body is held at a constant electric  
403 potential such as the case when the user is grounded or  
404 held an electric potential by a voltage source. By moving  
405 the user's hand or command control surface, toward the  
406 antenna, charge on the antenna rearranges itself. This  
407 polarization of charge on the antenna and surrounding  
408 objects is necessary to assure the electric potential is  
409 maintained on each object.

410

411 The above effect is very well known and is published for  
412 the case of an electrostatic source. It is commonly  
413 recognized when a static electricity source is moved in the  
414 vicinity of a high input impedance amplifier. The problem  
415 is a static electricity source is needed. Thus this  
416 phenomenon is not the preferred sensing method in the  
417 embodiment of this invention.

418

419 Instead, what is invented is a motional command system that  
420 uses the electric polarization phenomenon as a means to  
421 modulate the sensor's sensitivity to a characteristic  
422 background source. The physics of the process used in this  
423 disclosure is one involving scattering field theory rather

than source field theory like that for the electrostatic source. The motional commands are also discernable from DC offsets produced by electrostatic sources source such as lightning, or static buildup on the user or surroundings. The method of detection and signal processing method is now described for building a computerized motional command and body language interface.

A new feature in this invention is the deliberate use of the background noise characteristics to detection motional commands and body language. In this case, the motional commands modulate the sensitivity of the sensor to the characteristic A.C. background. In this case, the induced polarization charge on the antenna is caused by a spatial change in the electrical potential conditions. The electrical potential in the spatial dimension satisfies Laplace's equation. Doing so dictates the presence of the polarization charge on the antenna and the surrounding objects.

FIG2 shows a model of the amplitude reduction using a voltage divider. The capacitance  $C_{opt}$  occurs between the person's hand or body in proximity to the sensor, and the sensor. Since the antenna is small compared to wavelength, the antenna is not resonant, and the source impedance of the antenna is that of a capacitor. The capacitance depends upon the antenna geometry and its position relative to the surrounding objects. In the absence of the presence of the MCS user, i.e. beyond the range of the sensor, the capacitance  $C_{ant}$  is a small value probably having a stray capacitance of about 5-30 pF. Thus the antenna is a high impedance source at 50-60 Hz of order  $10^9$  Ohms. The parallel input resistor of 2.5 Megaohm reduces the antenna input impedance to this value causes some filtering and allows bias currents to flow. However, the amplifier is still very sensitive to the voltage across its input because the TL082 has an input of  $10^{12}$  Ohms.

When the MCS user is held at an electrical potential such as ground, and the user's command surface such as his or her hand is placed within the interaction zone of the MCS, additional polarization occurs to the charge on the antenna. This is equivalent to an additional capacitance forming between the antenna and ground. This capacitance is represented in FIG1 as  $C_{opt}$ . It is noted that the user is typically held at ground potential to see the effect of the  $C_{opt}$  best; but it is at times convenient to modulate the

user's electrical potential between ground potential and another so as to encode the modulation of the characteristic background. Hence command signals and body language from multiple users of the MCS could be coded and decoded so as to avoid interference. There are several methods or means to doing this. One is to naturally rely the electrically conductive property of the shoes. Another is to have the person touch a ground electrode or a modulated grounded electrode while giving the motional command.

The effect of the presence of  $C_{opt}$  is to reduce the sensitivity of the amplifier. Such reduction results in a noticeable amplitude modulation of the characteristic background noise waveform produced at the output of the MCS sensor in FIG1.

The capacitance  $C_{opt}$  is expected to behave as some inverse power to distance of separation between the antenna and the user's command surface. Also, it is expected to be proportional to the area of the antenna in the direction of the vector connecting the antenna center and user's command surface. It is also proportional to the command surface area.

For the circuit shown in FIG1, built on a prototyping board, a sensitivity of about 18 inches from the antenna was observable on an analog oscilloscope. The location was at the breakfast table of a newly constructed home. The setup uses a TL082 Texas Instrument JFET OP amp. The amplitude decreases as the user's hand approached the antenna that is a 4 inch piece of number 22 solid copper wire with insulation. This is in agreement with the model and the fact that capacitance appears inversely proportional to distance over this range of distances. The change in voltage is about 10% of 250 mV peak-to-peak signal. If the user is grounded through the ground wire in the electrical wiring the observed output signal from the circuit in FIG1 increased to 2.5 V peak to peak. Again the change in amplitude as the hand approached the sensor antenna is about 10%. Also, the signal is optionally frequency modulated by placing a resistor about 10 kOhm and a switch between the user and the common of the amplifier. Such a method may be used to make unique identification of issues of motional commands.

517 The sensitivity of the circuit to user motion is in part  
518 due to the high voltage sensitivity occurring from high  
519 input impedance of the buffer amplifier, and in part due to  
520 the filtering. The high frequency noise is removed by the  
521 low pass filter appearing before the gain stage shown in  
522 FIG1. The input circuitry to the buffer stage acts as a  
523 high pass filter. In fact, the output of signal level of  
524 the buffer stage is about 5 mV peak to peak for the  
525 particular level of 60 Hz AC background. Additionally, the  
526 final gain stage in this embodiment has a gain of about 50.

527  
528 The resistor parallel to the amplifier input is used to  
529 cause some high pass filtering and to prevent the  
530 amplification stage from saturating by adjusting input  
531 level to the gain stage and by providing a return path for  
532 the amplification stage.

533  
534 A variable resistor voltage-divider is also alternatively  
535 used as a to adjust the sensitivity by limiting the input  
536 into the low pass filter prior to the final amplification  
537 stage. The overall sensitivity to both the characteristic  
538 background and the modulation due to motional commands is  
539 also achieved by placing a capacitance in parallel with the  
540 shunt resistor R1 in FIG1.

541  
542 Since the modulation is only 10% of the characteristic  
543 signal amplitude, a differential amplifier is easily placed  
544 between to MCS sensors of FIG1. Preferably to antennas  
545 would drive two buffer stages like that in FIG1; but  
546 immediately afterwards a differential amplifier such as the  
547 Burr Brown LM105 would be used. The output of the  
548 amplifier would then go to the low pass filter and the  
549 final amplifier stage like that in FIG1.

550  
551 The particular values of components used, and the measured  
552 voltages depend upon depend upon the features of the  
553 characteristic signal used as input to detect the  
554 modulation due to capacitance changes between the antenna  
555 and the user. It is clear to anyone working in the art  
556 that the exact output level and sensitivity of the motion  
557 command system sensor shown in FIG 1, depends upon the  
558 users environment. Such variables are the ambient  
559 characteristic noise level input to the buffer amplifier  
560 and the frequency thereof, the antenna and input impedance  
561 characteristics of the amplifier, and the electrical  
562 potential, electrical conductive properties, and the size  
563 of the user control surface. Those skilled in the art of

564 electronics are able to modify and or make adjustable  
565 circuit parameters and physical properties of the system to  
566 have a MCS sensor to be tunable to operate in the users  
567 environment. But none-the-less the principle of operation  
568 is the sensitivity of the amplifier to the characteristic  
569 background noise is modified by the presence of the users  
570 command surface within the interaction zone of the sensor.

571

572 The motional commands system is sensitive to motional  
573 commands having duration of 0.5 - 3 second. The preferred  
574 embodiment of the MCS is in a computer or video display  
575 unit. FIG3 indicates the placing of sensors on the sides  
576 edges of a CRT computer monitor makes an array of MCS  
577 sensors. The sensors may be placed inside the monitor  
578 housing. Sensor sensors are placed to the left and right,  
579 top and bottom, and front and back of CRT monitor display  
580 area. The antennas of the sensors are oriented vertical  
581 direction on the right and left sides, horizontal on the  
582 top and bottom, and horizontal to the screen on the front  
583 and back. To make the positions of the sensor clear, FIG 2  
584 shows the layout.

585

586 The sensors work in pairs. The sensors on the right and  
587 left side are used to sense motion along the horizontal  
588 axis while the sensors on the top and bottom are used to  
589 sense motion along the vertical axis. The sensor pair on  
590 the front and back are used to sense motion along the axial  
591 axis perpendicular to the face of the screen.

592

593 Each sensor in the array sends a voltage signals to a data  
594 collection system that can process the signals. Such a  
595 system can be a stand-alone computer processor such as a  
596 DSP and analog to digital (A/D) converter, and support  
597 electronic hardware, or it can be the computer device the  
598 user is interfacing to with the MCS supplemented by some  
599 support electronic hardware. We refer here to the support  
600 electronic hardware including the A/D, control circuitry,  
601 and supplemental signal conditioning as the MCS support-  
602 ware.

603

604 In the preferred embodiment, the sensor signals are run  
605 into a differential amplifier so as to subtract out the  
606 background noise level. This may be done in hardware or  
607 software. The signals are digitally recorded by the  
608 computer soundcard. The sound card sampled at an  
609 appropriate rate to preserve quality. Prior to entering  
610 the soundcard, some hardware is used to multiplex the

611 analog signals from the six MCS sensors and amplify the  
612 signals if necessary. Thus the data from each sensor is  
613 sampled at 8 kHz if 48 kHz sampling rate is used on the  
614 sound card. Other sampling rates are off course possible.  
615 Additional amplification is also used to make the maximum  
616 input to the line of about 2.0 V peak to peak. An  
617 automatic gain control circuit is easily implemented. This  
618 amplifier comes after the MUX in the signal stream.  
619 Additionally, there are voltage comparators placed on the  
620 output of each sensor. Other triggering schemes are easily  
621 envisioned, such as by nearly real time software I/O.

622  
623 The interaction zone is defined as the volume of space  
624 where the motional commands are processed. The focal point  
625 is defined where as the origin in space where the motional  
626 commands will be issued. In the preferred embodiment,  
627 this is in front of the computer monitor a distance of  
628 about the separation between the horizontal pair of MCS  
629 sensors. At this point the user places their command  
630 control surface such as their hand. The MCS is activated  
631 and calibration data is collected by the data acquisition  
632 system. The data is used to scale the signals so the  
633 difference between signals from the pair of sensors is zero  
634 at the focal point.

635  
636 Next the user defines motional commands. By activating the  
637 command recorder software program, the sensor data is  
638 collected while the user issues the desired command to be  
639 recorded. This process is done several times to establish  
640 statistics and a database of commands. The signals from  
641 the sensor are used as training data for the MCS processing  
642 software. Commands to be issued by the computer as also  
643 assigned during the training period. Triggering threshold  
644 levels and logic are also determined during this process.

645  
646 Next an MCS command is issued. The sensors begin  
647 collecting data for a set duration of 0.2-3 seconds when  
648 the analog trigger level is exceeded. This happens upon  
649 motion of the user control surface about the interaction  
650 zone focal point. Based upon the signal processing of the  
651 training data, the trigger levels are determined and set  
652 automatically in the MCS support-ware by MCS software. Next  
653 the computer processor runs a digital processing algorithm  
654 and decides whether a command that was programmed is  
655 recognized. If so, the system responds with appropriately  
656 programmed action.

657

658 The digital processing command recognition algorithm  
659 extracts the envelope of the signals from the MCS sensors.  
660 Applies a calibration base on the focal point calibration.  
661 Then normalizes the data to maximum value of unity. From  
662 this cross correlations are computed between each channel  
663 of the training data and the channel data of the recorded  
664 acquisition. From the results correlation coefficients are  
665 obtained between the recorded command channel data and the  
666 training data. Commands are recognized by correlation  
667 values exceeding threshold values set on the correlation  
668 coefficients. The thresholds are set on six correlation  
669 coefficients for each channel, the autocorrelation, and  
670 five cross correlation coefficients.

671

672 The preferred embodiment is the most advanced application,  
673 and the number of sensors can change and be as few as one.  
674 For A.C. operation as describe the person or body is  
675 preferably grounded or connected to a switched grounded  
676 connection. For D.C. signals are recognized well when the  
677 person or body is not grounded. They appear well an  
678 increase in potential followed by a negative tail when the  
679 A.C. signal is filtered to remove the A.C. component of the  
680 line frequency. There are also intermediate states of  
681 conductivity between the body and the ground that result in  
682 a mixture both A.C. and D.C. components in the signal. The  
683 extent depends upon the filtering chosen and the gain of  
684 the subsequent stages of amplification, not shown of FIG1.  
685 Also, transient fields from charge polarization where  
686 potentials from muscle flexing can generate charge  
687 polarization that are possibly detected as the hand extends  
688 quickly to and fro the sensor.

689

690 Also the invention covers variations in implementation  
691 including hardware and software. The sensors can be  
692 implemented to detect DC offset caused by ungrounded  
693 bodies. The DC is seen more readily when the signal is low  
694 passed filtered and amplified. An ungrounded individual  
695 moving their hand passed the sensor is detected by  
696 recognizing the DC offset. This may only be a transient  
697 response, but being useful it is also covered in this  
698 invention for certain application of controlling devices  
699 such as toys. Otherwise the DC component shows up as a DC  
700 offset occur on the AC signal. Depending upon the degree of  
701 further amplification, it may be difficult to remove when  
702 caused by a transient sources such as passing the hand  
703 passed the sensor. Thus at times the DC component is  
704 indicative of proximity and useful in devices.

705

706 The invention may be used to detect a body's presence or  
707 the motion, such as an individual by either the D.C. shift,  
708 or A.C. amplitude reduction, and in some cases both  
709 phenomena.

710

711 The application of the invention applies to the sensing  
712 method, and is useful to make toys that producing music,  
713 lights, and motion of some object, triggered or controlled  
714 by the signal detected by the said sensors. In particular,  
715 a baby mobile, or a toy similar to the popular "Musini" by  
716 NeuroSmith, a toy that plays music as the children jump.  
717 Both these devices, and others, can benefit from the E-  
718 field sensor technology described in this invention. Also  
719 doors could be opened closed easily by hand motion. Also,  
720 the a person can also be detected by sensing through a door  
721 to notify as a door bell, or warn if someone is coming  
722 through the door.

723